

# Accelerated Site Technology Deployment

## Technology Fact Sheet

### Deployment of Innovative Intrusive and Non-Intrusive Characterization Technologies at the Old Cave

Ohio Operations Office/Miamisburg Environmental Management Project  
In Partnership with the Office of Science & Technology

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#### Introduction

The Mound Environmental Management Project (MEMP) is a 306-acre Department of Energy (DOE) closure site currently undergoing Decontamination and Decommissioning (D&D) activities. The major mission of the site was the production of weapons components. Up to 1954, a 1,000-sq. ft. room located in the Semi-Works (SW) Building, currently known as the Old Cave, was a hot cell used for the processing of radium (Ra-226) and actinium (Ac-227). The area underwent partial D&D, and was eventually entombed in 1959. The Old Cave is currently undergoing D&D activities and must be removed before the city of Miamisburg will accept ownership of the site. Work delays in and around the Old Cave have caused this area to become a potential Critical Path Item with the possibility of changing the final MEMP Closure date.

To recover schedule and distance the Old Cave from the Critical Path, a Value Engineering (VE) Study was sponsored by the Deactivation and Decommissioning Focus Area to propose alternatives for baseline schedule recovery. The VE Team recommended immediate characterization of the entombed contents; both radiological and physical, in order to properly characterize the Old Cave. Proper selection and application of the best tools to non-intrusively and then, if necessary, intrusively verify the radiological and physical conditions inside and under the concrete entombment will allow this critical schedule recovery to begin. The same technologies will then be deployed at the four other Ohio Closure Sites, since all are known to have contaminants and buried objects under concrete and in the underground lines.

To address the Site's needs, the DOE Office of Science and Technology (EM-50) has partnered with the Ohio Operations Office and the MEMP in

an Accelerated Site Technology Deployment (ASTD) project. EM-50 is providing a total of \$820K of funding over four years for deployment of the innovative non-intrusive and intrusive characterization technologies.

#### Technical Need

Radiological inventories remaining in the Old Cave, as well as physical items enclosed within the entombment are currently unknown. Conservative estimates indicate that 5 Curies of Ac-227 along with 12 Curies of Ra-226 could potentially remain in the Old Cave. Consequently, the present baseline dismantlement plan is based on these values, the necessary worker safety ramifications and the resulting expanded cost.

Decommissioning the legacy remaining in the Old Cave at MEMP poses a hazard to the workers and the surrounding community. Knowledge of the radionuclides and equipment items entombed in the Old Cave area is urgently required. The deployment of advanced non-invasive and invasive characterization technologies could provide the data for decision support tools to ensure a safe and thorough design for remediation and removal. An integrated approach for qualifying and deploying this suite of best available technologies is needed. In addition, support of some key technologies that have been demonstrated, but are not yet completely accepted by the project and regulatory personnel, is required in order to have them considered for use.

#### System Description

The ASTD will provide enhanced characterization through the use of several innovative technologies coupled with 3-D visualization and modeling of subsurface contamination to support an accelerated decommissioning schedule for the Old Cave. A suite of innovative characterization, subsurface access, and modeling and visualization tools



described below will be deployed as needed including:

- 3-D modeling and visualization to optimize sampling and graphically represent results, e.g., Geographic Information System (GIS) and Smart Sampling™
- In Situ Object Counting System to provide real-time characterization of soil in situ as well as collected soil samples
- Pipe Explorer™ and SEAMIST™ to conduct borehole characterization of alpha, beta, and gamma emitting radionuclides
- Diamond Core Drilling to cut through concrete to provide direct access to soils under buildings
- Ground penetrating Radar and Time-Domain Electromagnetics to characterize location of footers, unknown objects, wetted soils and overall positioning of materials outside walls and under foundation of Critical Path Ohio Buildings
- Small footprint Geoprobe with a real-time Position Location determination device or a small footprint horizontal drilling apparatus to obtain samples from most likely locations for contaminants
- Tracers to identify potential pathways for contaminant migration under facilities

### **Benefits**

The Baseline Plan includes a cursory examination of the Old Cave Entombment by using the non-invasive gamma spectroscopy characterization technology to scan for higher levels of gamma radiation. This limited examination was to be

conducted prior to initiating the safety preparatory actions and subsequent demolition, packaging, and shipping of the materials off-site for burial. Safety preparatory actions include removal of all equipment adjacent to the entombment and construction of a secondary containment. These actions could not begin for nine months to one year because of the work delays. Using an advanced suite of characterization technologies allows characterization to begin immediately.

Sampling by means of non-intrusive and then intrusive advanced technologies is necessary to better define actinium and radium levels. Once better defined radioactivity levels are determined, and a final design decision to the Baseline Plan is made, several enhancements that shorten the schedule and reduce costs may result. A baseline recovery of only one-week would recoup the entire ASTD investment. If the baseline acceleration is greater than the one week, the return on investment will increase proportionally as additional weeks/months are saved from the baseline. Based on the VE study, it is conservatively estimated that four months can easily be recovered when compared to the present technical approach.

### **Status**

Work planning and preparing work documents for the characterization will begin in May 2000. Deployment of technologies should begin in June 2000. Safe shutdown of the Old Cave should occur in January 2001. Old Cave area decontamination should be completed by September 2003.

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### **For more information about deployment of Innovative Intrusive and Non-Intrusive Characterization Technologies at the Old Cave**

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